

THE
EVOLUTION
OF
"IRON LUNGS"

(RESPIRATORS OF THE BODY-ENCASING TYPE)

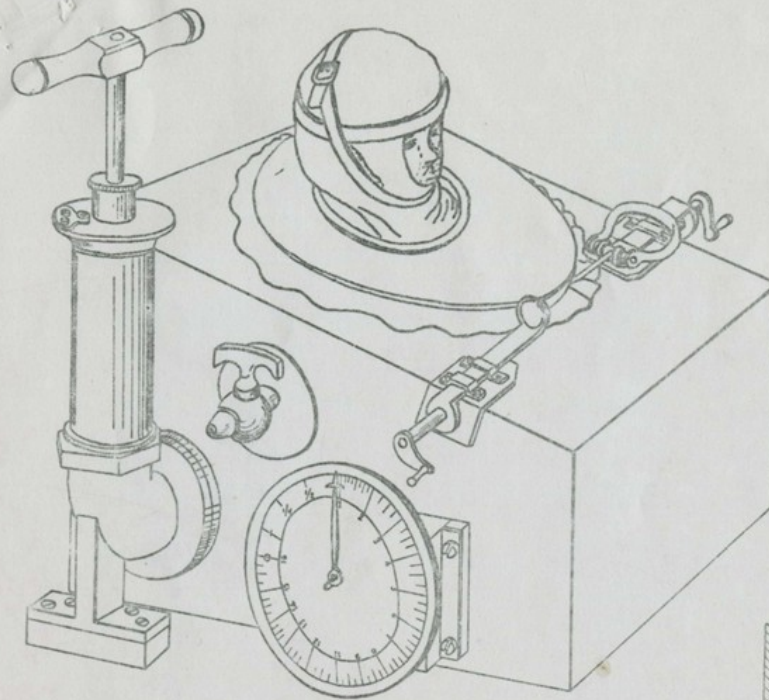
GATHERED FROM
PATENTS AND MEDICAL PUBLICATIONS
BY THE J. H. EMERSON COMPANY

ONE FINDS THAT INVENTORS IN MANY COUNTRIES HAVE REACHED THE SAME GOALS, WORKING ALMOST COMPLETELY WITHOUT KNOWLEDGE OF EACH OTHERS' ACHIEVEMENTS. ALL CONTRIBUTED VALUABLE IDEAS IN THIS LIFE-SAVING EVOLUTION, ALTHOUGH VERY FEW BUILT RESPIRATORS THAT WERE WIDELY USED. COMPLETE SUCCESS WAS DIFFICULT, REQUIRING MECHANICAL ABILITY, KNOWLEDGE OF PHYSIOLOGY, ATTENTION TO NURSING CARE, WIDESPREAD DEMAND (AS IN AN EPIDEMIC) AND ADEQUATE FINANCES.

THE EVOLUTION PICTURED HERE HAS NOT ENDED, BUT WONDERFUL MACHINES NOW EXIST, AND THOUSANDS OF LIVES HAVE BEEN SAVED.

EMERSON RESPIRATORS WERE SHOWN ALSO IN THE
CHICAGO, NEW YORK, SAN FRANCISCO WORLD'S FAIRS

ALMOST CERTAINLY OTHER IRON LUNGS WERE INVENTED WHICH OUR SEARCH HAS FAILED TO DISCOVER. IF YOU HAVE INFORMATION ABOUT ANY VALUABLE INVENTION OF THIS KIND NOT SHOWN HERE, WE HOPE YOU WILL SEND IT TO J. H. EMERSON COMPANY, CAMBRIDGE 40, MASSACHUSETTS, U. S. A.

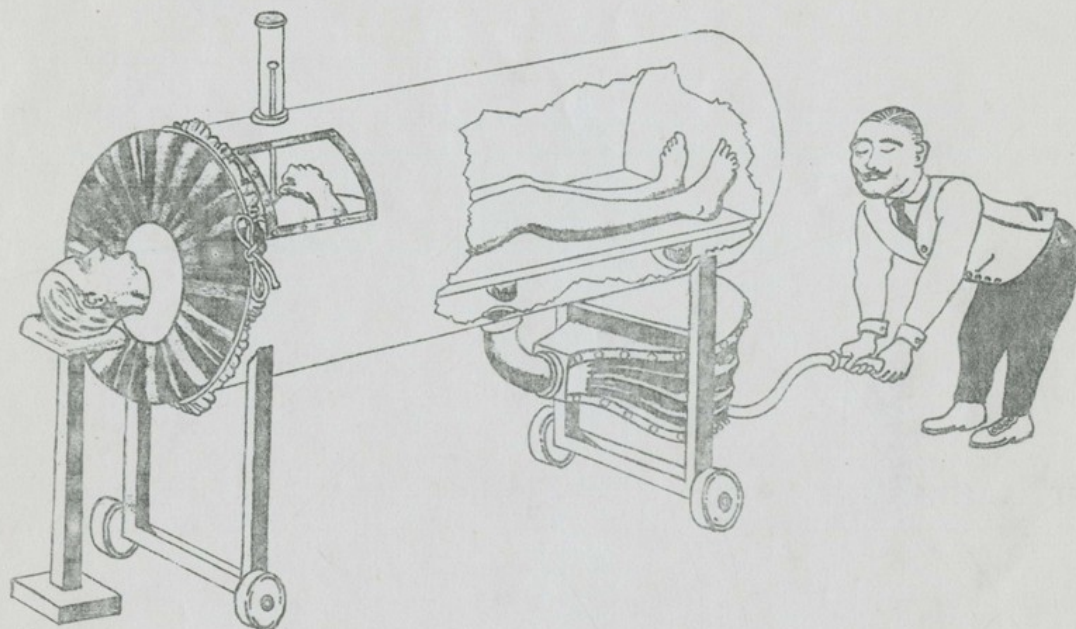


1864

NO. 1 - EMERSON EXHIBIT

JONES

The earliest body-enclosing iron lung we know of was described by Alfred F. Jones of Lexington, Kentucky, in 1864. U.S. patent No. 44 198 says he "cured paralysis, neuralgia, rheumatism, seminal weakness, asthma, bronchitis, and dyspepsia. Also deafness. "... when properly and judiciously applied many other diseases may be cured..."



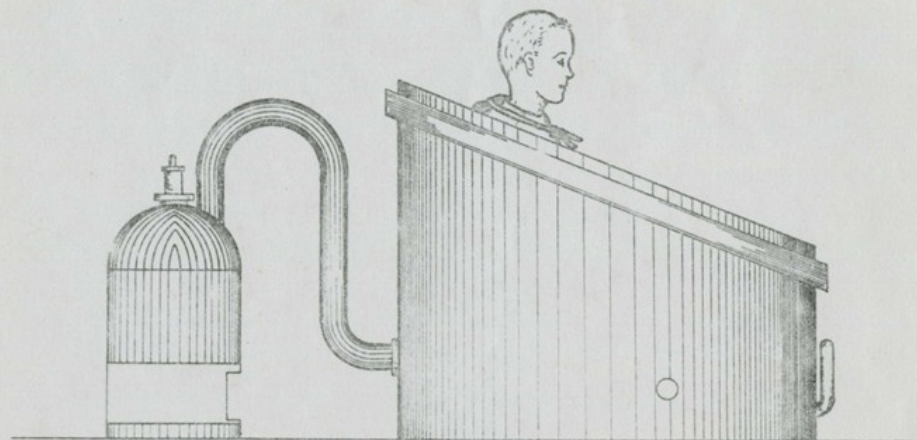
1376

NO. 2 - EMERSON EXHIBIT



WOILLEZ

In 1876 Dr. Woillez of Paris built the first workable iron lung, which he called a "spirophore". It had the basic elements of modern respirators, including an adjustable rubber collar and a sliding bed. A unique feature was a rod which rested lightly on the patient's chest, to give visual proof of actual lung expansion. In a brilliant lecture presented before the Academy of Medicine on June 20, Woillez showed a thorough understanding of the physiology and mechanics of artificial respiration. He refused to patent his invention. A colleague suggested placing spirophores all along the Seine, for drowning rescues, but finances for this public service were lacking. (The illustration was reconstructed by Maxfield Parrish, Jr., for a legal battle, years before the inset photograph was discovered.)

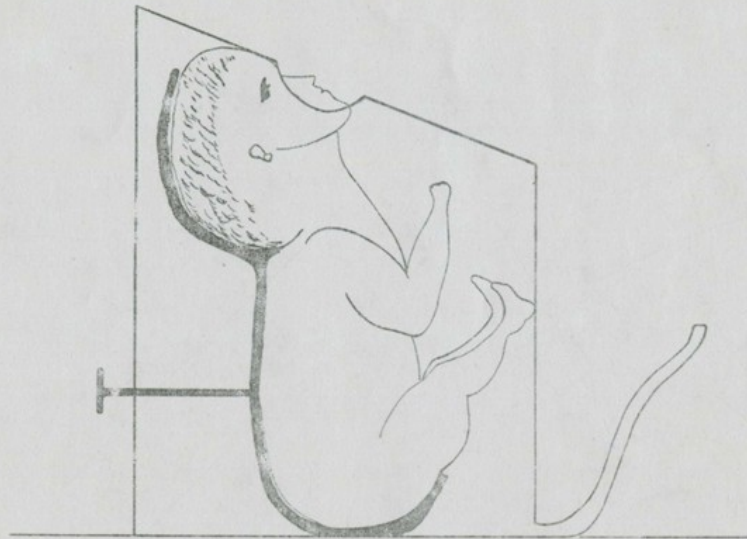


1887

NO. 3 - EMERSON EXHIBIT

BREUILLARD

Dr. Charles Brevillard of Paris patented a "bath cabinet" type of respirator in 1887. For a source of vacuum he recommended "a steam ejector fed by a steam boiler...heated by a spirit lamp." The patient himself was supposed to operate a valve, alternately connecting the cabinet with the vacuum, for inhalation, and with the atmosphere, for exhalation. Brevillard also described a chest respirator ("cuirass") to be operated in the same way, and a face-mask.

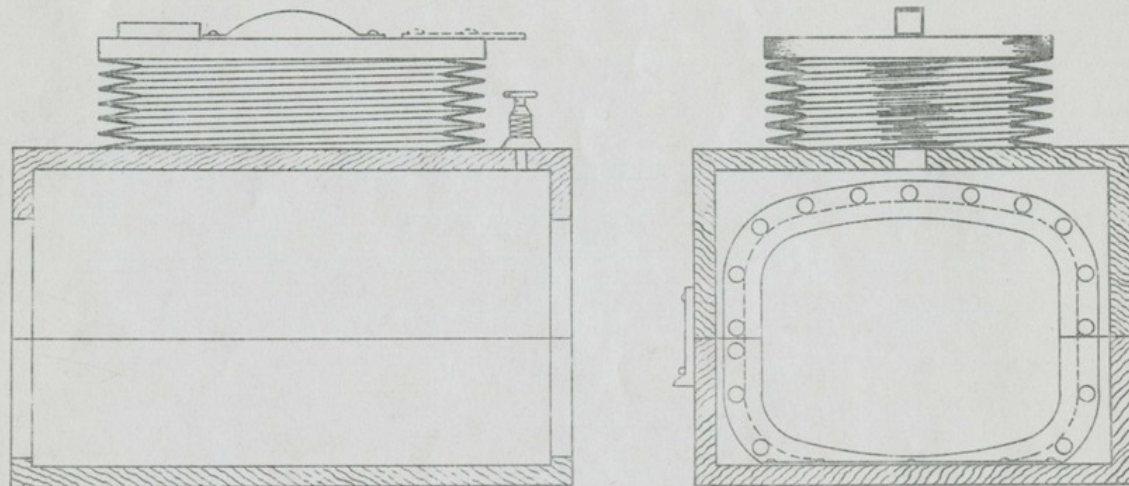


1889

NO. 4 - EMERSON EXHIBIT

BRAUN

For "resuscitating asphyxiated children" Dr. Egon Braun of Vienna devised a small wooden box in which pressure and suction were created by the doctor's own breath (through the tube at the right). The infant was supported in a plaster mold, with nose and mouth pressed against an opening in the rubber closure. (This picture, from the Boston Medical and Surgical Journal of 1889, is only a rough diagram.) Dr. Braun reported 50 consecutive successful cases.

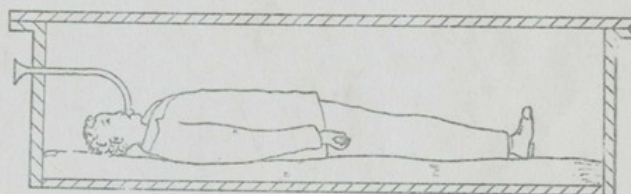
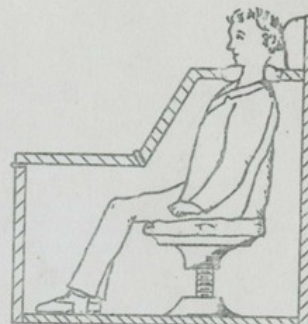
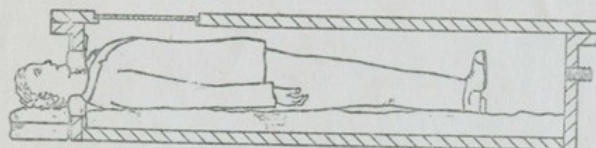


1901

NO. 5-EMERSON EXHIBIT

EISENMENGER

In 1901 Rudolf Eisenmenger of Piski, Hungary, patented a portable respirator which consisted of a "simple, two-part box" enclosing only the patient's chest and abdomen. Later he became medical professor in Vienna, and there continued to improve his invention. He stressed the importance of access to the patient's throat and limbs, of portability, and of hand-operation. (Motors were also mentioned.) There are reports of "extraordinary success" with Eisenmenger's respirators.

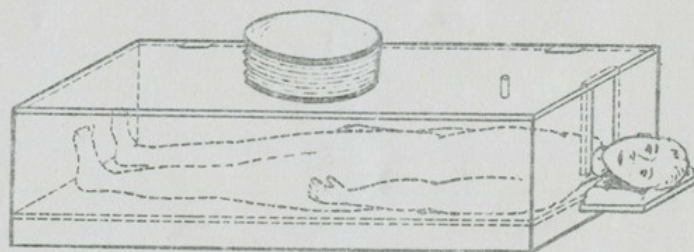


1905

NO. 6 - EMERSON EXHIBIT

DAVENPORT

William Davenport of London understood the mechanics of artificial respiration clearly. His patent in 1905 mentions a box, a rubber collar, and a simple bellows or piston pump. He lacked the sliding bed (of Woillez and modern iron lungs) but made several good suggestions, including the supplementary use of oxygen. He proposed several types, including a "collapsible form... to facilitate transit."

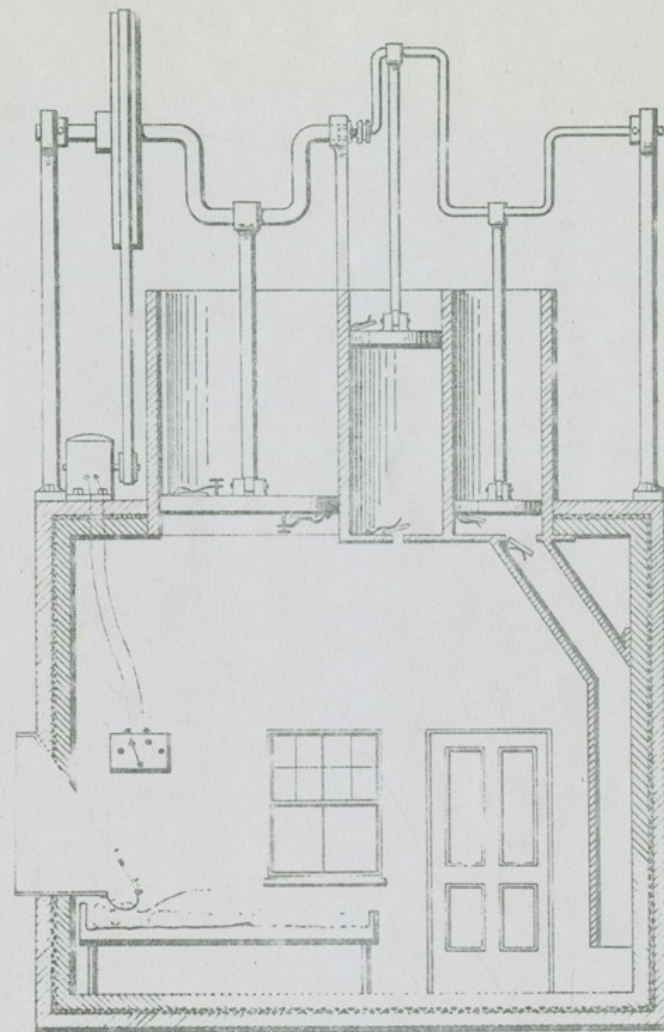


1905

NO. 7-EMERSON EXHIBIT

HAMMOND

Dr. Charles Morgan Hammond of Memphis, U.S.A., built his first "artificial lung" in 1905 and a series of improved models throughout the next 20 years. He performed experiments and treated patients successfully, but his respirators were not produced commercially and remained unknown to the public for many years.

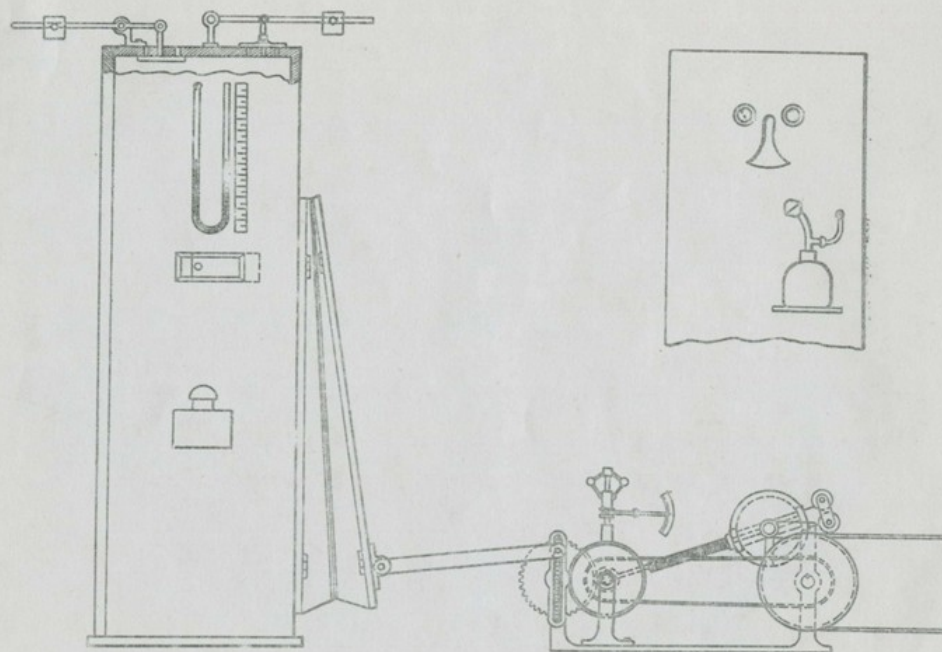


1908

NO. 6 - EMERSON EXHIBIT

LORD

In 1908 Peter Lord of Worcester, U.S.A., patented a respirator room. He pictured huge pistons to create the pressure changes and to supply fresh air. An enormous motor would have been needed and very heavy construction. However, the idea of a room is good, because it makes nursing care easy.

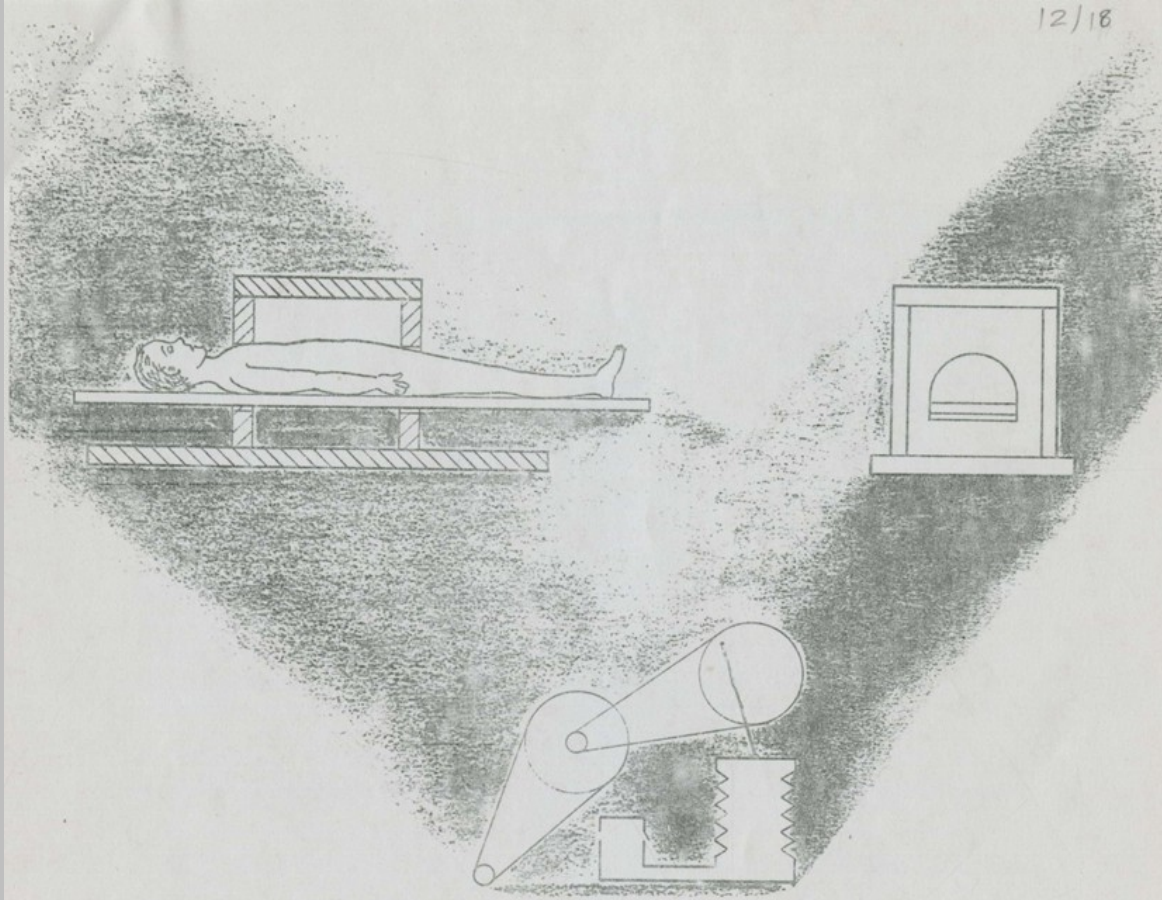


1916

NO. 9-EMERSON EXHIBIT

SEVERY

The patent granted to Melvin L. Severy of Boston, U.S.A., in 1916 shows little concern for the patient's comfort but includes ingenious mechanical elements. In the model illustrated, the patient was obliged to stand, pressing his nose and mouth against a triangular aperture below 2 eye-windows. Severy also described variable-speed pulleys and elaborate electromagnetic controls for regulating speeds and pressures. He suggested came to produce various pressure curves. A cuirass respirator and mask resuscitator were mentioned also.

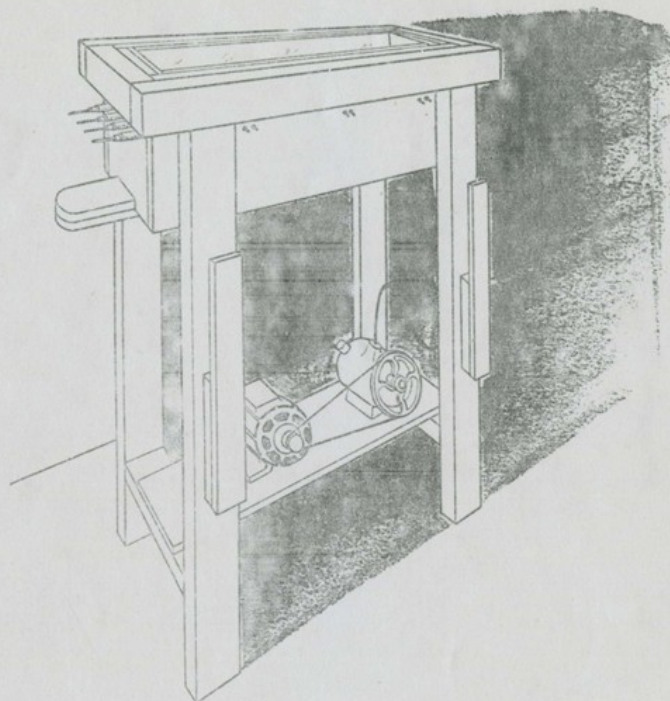


1918

NO. 10—EMERSON EXHIBIT

STEUART

Dr. W. Stewart of South Africa built a simple respirator and demonstrated a working model to his colleagues (Medical Journal of South Africa, 1918). He proposed plaster of Paris to seal around the patient's shoulders and pelvis, but friends quickly suggested other more practical materials. Stewart was the first to think primarily of poliomyelitis. He even envisaged a ward piped with intermittent suction, to which individual body casings could be attached.

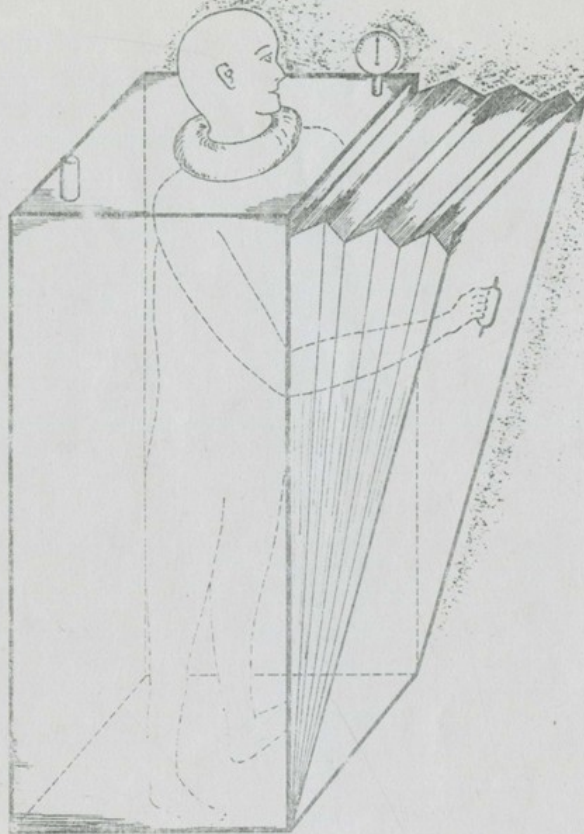


1919

NO. 11 - EMERSON EXHIBIT

CHILLINGWORTH

Felix P. Chillingworth and Ralph Hopkins of New Orleans, U.S.A., built a plethysmograph to study circulatory changes resulting from lung distention. They also used it as a dog respirator. "... pulmonary ventilation is accomplished by rhythmic changes in air pressure within the plethysmograph causing alternate distention and collapse of the lungs." (1919, *Journal of Laboratory and Clinical Medicine*.)

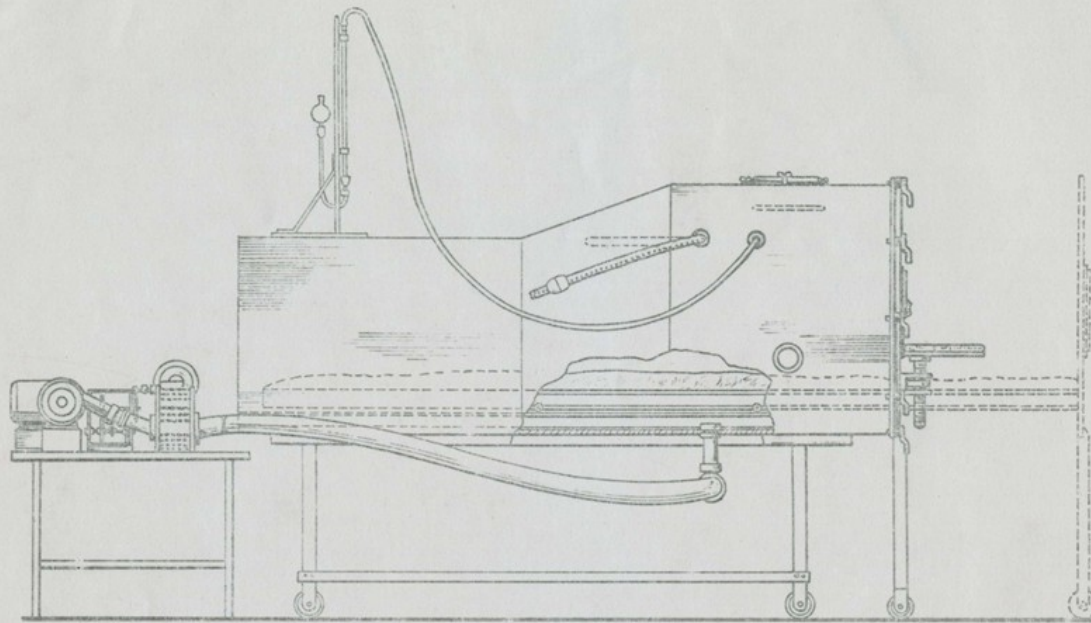


1926

NO. 12 - EMERSON EXHIBIT

SCHWAKE

Wilhelm Schwake of Oranienburg-Eden, Germany, patented a "pneumatic chamber" in 1926. He was concerned with portability and with exactly matching the patient's breathing depth and rhythm. He also stated that "negative pressure... upon the skin... draws out... the gaseous by-products." We would not consider this respirator practical for severely ill patients, but the picture is a great favorite.

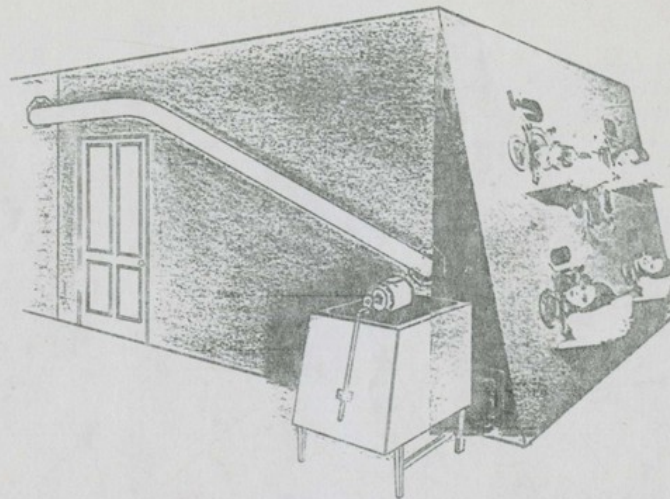


1928

NO.13-EMERSON EXHIBIT

DRINKER & SHAW

The first "iron lung" to receive widespread use was developed in 1928 in Boston, and was patented by Philip Drinker and Dr. Louis Agassiz Shaw. It was cumbersome and inconvenient but saved a number of lives. It had a sliding bed with head-wall attached, and a rubber collar. Pressure changes were created by a rotary blower and an alternating valve. During a polio epidemic the Consolidated Gas Company of New York paid for building large numbers of these respirators, and reports of their use spread quickly around the world.

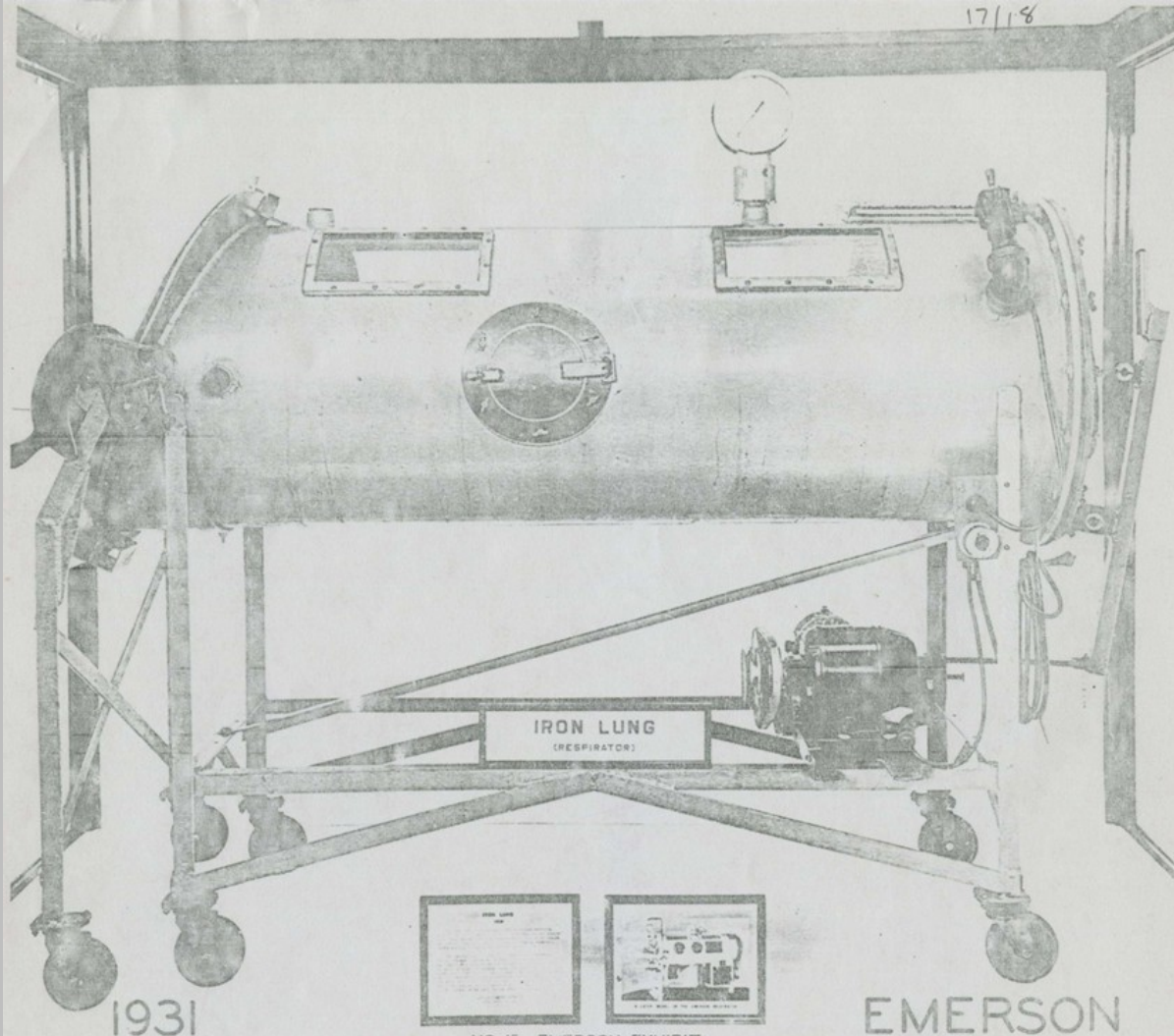


ACTUAL PHOTOGRAPH

NO. 14—EMERSON EXHIBIT

WILSON & DRINKER

In the early respirators it was difficult to give complete nursing care and to change the patients' position frequently. This care was found to be of life-saving importance, so Dr. James L. Wilson asked for a room in which several patients could be made to breathe simultaneously. A nurse could enter by the door and perform all procedures efficiently. The room pictured was built at the Children's Hospital in Boston, U.S.A., and was used successfully during several epidemics.



Because of a severe poliomyelitis epidemic in 1931 John Haven Emerson of Cambridge, U.S.A., built a simplified respirator. It cost less than half as much as others, but contained many improvements. It operated quietly, using a bellows to create the changes of pressure (as Woillez's did, but with a motor added). A wide range of speeds was instantly available. Opening and closing were rapid and convenient. It could be pumped by hand if electricity failed. The first Emerson "iron lung" is now preserved in a glass case in the United States National Museum (the Smithsonian Institution) as the prototype of respirators constructed since 1931 in America and Europe.